

**Design for Sustainable Communities**  
Civil and Environmental Engineering 290, CCN 14260, 3 Units  
Spring Semester 2010

**Instructor:** Dr. Susan Addy  
Email: [susan.e.addy@gmail.com](mailto:susan.e.addy@gmail.com)  
Office: 621C Sutardja Dai Hall (CITRIS Building)  
Office Hours: M 1-2pm, W 10-11am

**GSI:** Johanna Mathieu  
Email: [jmathieu@berkeley.edu](mailto:jmathieu@berkeley.edu)  
Office Hours: T 12:30-1:30 in 642 Davis Hall

**Lectures:** T, Th 11-12:30, 212 O'Brian Hall

**Prerequisite:** Graduate standing, or consent of instructor.

**Website:** <http://bSpace.berkeley.edu>

**Past projects:** <http://eetd.lbl.gov/staff/gadgil/teaching.html>

**Course Description:**

This course provides conceptual and hands-on experience in design and implementation of innovative products or processes for improving the sustainability of resource-constrained communities (mostly poor ones in the developing countries). Teams of students will take on practical projects, with guidance from subject experts. The goal is to turn innovations into useful products or processes, and to assess social and business opportunities for real-world dissemination of these products. Hands-on work is complemented by an interdisciplinary lecture series on economics, diffusion of innovations, user-centered design, project impact evaluation, and in-depth case studies of successful, failed, and ongoing real-world projects. Because these problems are interdisciplinary in nature, we welcome students from a variety of backgrounds, including engineering, physics, ERG, environmental science, architecture, economics, business, public policy, and public health, among others.

**Course Outline:**

- Sustainable development
- User needs assessment
- Design for development (DfD), Design for X (DfX), Human-centered design
- Project implementation
- Project evaluation
- Case studies of DfD projects

**Readings:**

- Everybody Loves a Good Drought: Stories from India's Poorest Districts (P. Sainath 1992), \$25.20 on Amazon. This book is *required*. Note that there is a glossary of terms on bSpace.
- The Design of Everyday Things (D. Norman 2002), \$11.52 on Amazon.  
This book is *highly recommended* for anyone who has not taken an engineering design course. The first chapter of this book will be provided as a scanned pdf and required of all students.
- Other readings will be available on bSpace.

**Grading:**

Weekly Reflections	10%
Weekly Project Updates	10%
Midterm Design Review	10%
Midterm Progress Report	15%
Final Presentation	20%
Final Report	30%
Team Binder	5%

**Weekly Reflections (referred to as WR in 'Detailed Syllabus' below):**

Each student is responsible for posting weekly reflections on readings and classroom discussions on bSpace. Reflections are due Monday at midnight. Reflections should never simply summarize the readings/discussions. Instead, you should connect the readings/discussion to your background, experiences, project, etc. The instructor/GSI will generally post questions along with the readings to help you think about how the readings are relevant to you and your project. Please read other students' reflections and respond to others' comments, ideas, etc. Each reflection should be 200-400 words.

**Weekly Project Updates:**

Each team is responsible for posting weekly project updates on bSpace (one per team per week). Project updates are due by Monday at midnight. Project updates should include a brief description of the current state of your project. Include any accomplishments and set-backs, and goals for the next week. This is a good forum for asking for help in indentifying resources and knowledge from the instructor, GSI, and your classmates. If you have particular issues that you would like to discuss with the instructor or GSI, your team can also schedule a meeting with the instructor or GSI during office hours or otherwise.

**Initial Presentations:**

On February 16, each team will give a short presentation on their project including a description of the problem they are trying to solve including information about the background/context and preliminary project goals. After the presentation, your team will be required to post this presentation on bSpace and it will act as your weekly project update for that week.

**Midterm Design Review and Midterm Progress Report:**

Each group will participate in a midterm design review and submit a short midterm progress report (which will become the basis for your final report). Details about the format of the design review will be provided later in the course.

**Final Presentation, Report, and Team Binder:**

Final project presentations will be open to the others outside the class, and we encourage you to invite your mentors. Though the presentations are important, your final report is the most important piece of work you will produce for this class. We hope that most projects will be continued (in some shape or form) long beyond the timeframe of this class and so documentation is key. Think of your final report as a comprehensive piece of work that you could pass on to a future team so that they can learn from what you've done, even years after you've left Berkeley. Also note that final presentations and final reports will be posted to Ashok's website: <http://eetd.lbl.gov/staff/gadgil/teaching.html>.

**Required Meetings with Instructor and GSI:**

Each team is required to meet with either the instructor or GSI (rotating) once per month to discuss their project, the progress they have made, any roadblocks they are facing, and their upcoming plans. The purpose of these meetings is for the instructor/GSI to understand how your project is progressing and for the instructor/GSI to provide useful feedback and advice to your teams. Additional meetings with the instructor or GSI can be schedule during office hours or otherwise as needed. Required meetings will be scheduled for the week of Feb 15, March 15, and April 21.

**Important Dates:**

First Day of Class	Tue Jan 19
Project Ranking Due	Wed Jan 27, 5pm (on SurveyMonkey)
Initial Survey	Thurs Jan 28, 11:59pm (on SurveyMonkey)
Initial Presentations	Thurs Feb 11 (in class)
Midterm Survey	Thur Mar 18, 11:59pm (on SurveyMonkey)
Spring Break	Mon Mar 22 - Fri Mar 26
Midterm Design Review	Tues Mar 30, Thurs Apr 1 (in class)
Midterm Progress Reports Due	Fri Apr 2, 5pm (on bSpace)
Final survey	Thur Apr 27, 11:59pm (on SurveyMonkey)
Last Day of Class	Fri Apr 29
Reading Week	Mon May 3 – Fri May 7
Final Presentations	Thurs May 13, 8-11am (in final exam slot)
Final Papers/Team Binder Due	Fri May 14, 5pm (on bSpace)

## Detailed Syllabus:

Date	Topic	Instructor/ Speaker	Deliverables	Readings, etc. (mostly available on bSpace)
WR=Weekly Reflection				
Tues	1/19/2010	L1: Introduction, Motivation	Susan, Johanna, Ashok Gadgil	<p><i>Handouts:</i></p> <ol style="list-style-type: none"> <li>1. Syllabus</li> <li>2. Advice from past students</li> <li>3. Project descriptions</li> <li>4. Reading efficiently</li> </ol> <p><i>Optional:</i></p> <ol style="list-style-type: none"> <li>1. Supplemental information on each of the projects</li> </ol>
Thurs	1/21/2010	L2: Overview of course,  Sustainable development	Susan	<p><i>Readings (due for 1/25 WR):</i></p> <ol style="list-style-type: none"> <li>1. Sustainable Development (Parris and Kates 2003)</li> <li>2. Eight Commandments (Economist 2007)</li> <li>3. Critical Review (Lele 1991)</li> <li>4. Money and Happiness (Newsweek 2007)</li> </ol> <p><i>Optional:</i></p> <ol style="list-style-type: none"> <li>1. The Elusive Concept of Sustainability (Marshall 2005)</li> </ol>
Tues	1/26/2010	L3: Project descriptions	Susan, Johanna, Mentors	<p><i>Optional:</i></p> <ol style="list-style-type: none"> <li>1. Happiness (Economist 2006)</li> </ol>
				<p>Student questionnaire due 11:59pm (bSpace)</p> <p>Project ranking due 1/27 5pm (SurveyMonkey)</p>
Thurs	1/28/2010	L4: Finding project resources,  Course logistics,  Design 1,  Last 5 minutes of class reserved for team meetings	Jonathan Slack, Howdy Goudey, Susan, Johanna	<p>Initial survey due 11:59pm (SurveyMonkey)</p> <p><i>Handouts:</i></p> <ol style="list-style-type: none"> <li>1. Team management,</li> <li>2. Working with your mentor</li> <li>3. Team resources</li> <li>4. Budget/expense list</li> <li>5. Reimbursement forms/protocol</li> </ol> <p><i>Readings (due for 2/1 WR):</i></p> <ol style="list-style-type: none"> <li>1. Lessons (Reddy 1989)</li> <li>2. IDEO Toolkit -Introduction (2009)</li> <li>3. Polak (Zuckerman 2007)</li> <li>4. Paul Polak video</li> <li>5. Nunez Stove (LATimes 2007)</li> </ol>
Tues	2/2/2010	L5: Project goal development	Susan	<p><i>Readings (due for 2/1 WR):</i></p> <ol style="list-style-type: none"> <li>1. Sainath 1-38 (opt to 77)</li> <li>2. Exponential Growth (Hubbert 1993)</li> <li>3. Sustainable Growth Impossibility (Daly 1993)</li> </ol> <p><i>Optional:</i></p> <ol style="list-style-type: none"> <li>1. Social Innovations Interviews (read 1-3 interviews)</li> </ol>

Thurs	2/4/2010	L6: Living in Poverty – who are our users?	Susan and Johanna		<p><i>Readings (due for 2/8 WR):</i></p> <ol style="list-style-type: none"> <li>1. Seeds of Famine Ch3 (Franke and Chasin 1980)</li> <li>2. Africa and Slave Trade Graphics</li> <li>3. Debt Cancellation (50 Years is Enough Network 2009)</li> </ol> <p><i>Resources</i></p> <ol style="list-style-type: none"> <li>1. Websites Useful for Research</li> <li>2. Selected Indigenous Peoples Organizations</li> </ol>
Tues	2/9/2010	L7: User needs assessment	Isha Ray		<p><i>Readings (due for 2/8 WR):</i></p> <ol style="list-style-type: none"> <li>1. IDEO Toolkit - Hear (2009)</li> <li>2. TBA</li> </ol>
Thurs	2/11/2010	L8: Initial presentations	Students	<p>Initial presentations (in class)</p> <p>Initial team budgets due 11:59pm (bSpace)</p>	None
Tues	2/16/2010	L9: Design 2	Susan		<p><i>Readings (due for 2/15 WR):</i></p> <ol style="list-style-type: none"> <li>1. Design of Everyday Things (Norman 2002), pg 1-53</li> <li>2. IDEO Toolkit – Create (2009)</li> <li>3. Wheelchair Makeover (BBC News 2006)</li> <li>4. Design for World's poor (NYT 2007)</li> </ol>
Thurs	2/18/2010	L10: Design 3	Susan		<p><i>Readings (due for 2/15 WR):</i></p> <ol style="list-style-type: none"> <li>1. Zimbabwe Bush Pump (Laet and Mol 2000)</li> <li>2. Why to be Wary (Donaldson 2008)</li> <li>3. Case Study – Rural Electrification (Chaurey 2003)</li> </ol> <p>If you have minimal design background:</p> <ol style="list-style-type: none"> <li>4. Design of Everyday Things (Norman 2002), pg 54-80</li> </ol>
Tues	2/23/2010	L11: How economics and discount rates affect decisions by the poor	Johanna		<p><i>Readings (due for 2/22 WR):</i></p> <ol style="list-style-type: none"> <li>1. Poverty &amp; Discount Rates (Khan 2008)</li> <li>2. Discounting Health – Section 7 (WHO 2000)</li> <li>3. Sainath 134-147 (opt to 192)</li> </ol> <p><i>Other Resources:</i></p> <ol style="list-style-type: none"> <li>1. Energy Economics (Masters 2004)</li> <li>2. Discount Rates for Energy Decisions (Train 1985)</li> <li>3. Conserving Energy with CFLs (Gadgil and Rosenfeld 1990)</li> </ol>

Thurs	2/25/2010	L12: Implementation	Susan		<i>Readings (due for 2/22 WR):</i> 1. IDEO Handbook – Deliver (2009) 2. Low Cost Irrigation Tech (IDE 2005) 3. Aid that works (Keene-Babcock 2006) 4. Fortune at BOP: Mirage (Karani 2006)  <i>Optional:</i> Technology and Poverty (UNUIAS 2003)
Tues	3/2/2010	L13: Business models to serve the poor	John Danner		<i>Readings (due for 3/1 WR):</i> 1. TBA
Thurs	3/4/2010	L14: Case studies: Energy/efficiency technologies	Kurt Kornbluth		<i>Readings (due for 3/1 WR):</i> 1. TBA
Tues	3/9/2010	L15: Group work: Business models and implementation	Susan and Johanna		<i>Readings (due for 3/8 WR):</i> 1. Off-grid Electrification (Reiche 2000) 2. IDEO Handbook – Deliver (2009) (reread/skim)
Thurs	3/11/2010	L16: Microfinance	Ananya Roy		<i>Readings (due for 3/8 WR):</i> 1. TBA  <i>Resource:</i> 1. Millions for Millions (The New Yorker 2006)
Tues	3/16/2010	L21: Diffusion of Innovations 1	Johanna		<i>Readings (due for 3/15 WR):</i> 1. Diffusion of Innovations Chapter 1 (Rogers 2003), 2. ORS Case Study (Rogers 2003), 3. Diffusion of Healthcare (Berwick 2003), 4. Limits to Leapfrogging (Economist 2008)
Thurs	3/18/2010	L22: Diffusion of Innovations 2	Johanna	Midterm survey due 11:59pm (SurveyMonkey)	<i>Readings (due for 3/15 WR):</i> 1. Polio (NYTimes 2006) 2. Socio-cultural Pitfalls (Bose 1997)
Tues	3/23/2010	Spring Break			
Thurs	3/25/2010	Spring Break			
Tues	3/30/2010	L19: Midterm Design Review	Students	Midterm Design Review (in class)	None
Thurs	4/1/2010	L20: Midterm Design Review	Students	Midterm Design Review (in class)  Midterm Progress Report due Fri 4/2 5pm (bSpace)	None
Tues	4/6/2010	L17: Case Study: UV Waterworks	Ashok Gadgil		<i>Readings (due for 4/5 WR):</i> 1. Drinking Water (Gadgil 1998) 2. OLPC Demise (Hammond 2007)

Thurs	4/8/2010	L18: Project Evaluation	Susan		<i>Readings (due for 4/5 WR):</i> 1. Sainath 317 – 338 (opt to 370) 2. Dissemination of Karnataka Cookstoves (Jagadish 2004) 3. Development Credits (Van Buskirk 2008) (skim)  <i>Resources:</i> 1. Program Evaluation (Ed Vine ppt presentation – resources within)
Tues	4/13/2010	L23: Case study: Diffusion of improved lighting	Ashok Gadgil		<i>Readings (due for 4/12 WR):</i> 1. Stalled on the Road (Gadgil and Sastry 1994) 2. Barriers to Adoption (Reddy 1991)  <i>Optional:</i> 1. Bombay Lighting Initiative (Sastry and Gadgil 1996) 2. Conserving Energy With CFLs (Gadgil and Rosenfeld 1990)
Thurs	4/15/2010	L24: PR/Funding, Elevator pitches	Andree Sosler, Johanna	Five key points about your project	<i>Readings (due for 4/12 WR):</i> 1. TBA
Tues	4/20/2010	L25: Alternative viewpoints: Jaipur Foot, Barefoot College	Susan		<i>Readings (due for 4/19 WR):</i> 1. Jaipur Foot (Macke 2003) - skim to pg 15, then read to end 2. Barefoot College in Tilonia (Roy 1997) 3. Rural Community vs Urban Engineer (Roy 1997)
Thurs	4/22/2010	L26: Case Study: Evaluation of Patsari cookstoves	Omar Masera		<i>Readings (due for 4/19 WR):</i> 1. TBA
Tues	4/27/2010	L27: Case Study: Blue Energy	Mathias Craig	Final survey due 11:59pm (SurveyMonkey)	<i>Readings (due for 4/26 WR):</i> 1. TBA
Thurs	4/29/2010	L28: Alternative viewpoints (Cont'd): Positive Deviance, SEARCH  Course evaluation	Susan, Johanna	Course evaluations (in class)	<i>Readings (due for 4/26 WR):</i> 1. Positive Deviance for Malnutrition (Agnihotri 2006) 2. Positive Deviance for Infant Survival (on Dr. Bang 2003)  <i>Optional:</i> SixDs of Positive Deviance

Final project presentations are Thurs May 13, 8-11am (in the Final Exam Slot).  
 Final papers, team binder, and final expense report are due Friday May 14, 5pm.

### **Academic Dishonesty:**

Please visit <http://students.berkeley.edu/osl/sja.asp> to review the University Code of Student Conduct. There will be no tolerance for academic dishonesty in the course.

For information on plagiarism see:

The CEE Graduate Student Handbook: [www.ce.berkeley.edu/grad/pdf/handbook.pdf](http://www.ce.berkeley.edu/grad/pdf/handbook.pdf)

UC Berkeley Academic Services: <http://academicservices.berkeley.edu/advising/resources/plagiarism/>

UC Berkeley Catalog: <http://catalog.berkeley.edu/policies/conduct.html>

***Students with Disabilities:***

If you have a Letter of Accommodation from the Disabled Students Program please provide a copy to the instructor as soon as possible.

### ***Supplemental Reading List:***

Note that this list is purely for your own enjoyment and further education. It was created over the past years of this course. Many students wanted recommendations to amazing books that shed light on some of the ideas mentioned in the course.

1. Amartya Sen (2000): Development as Freedom
2. Amartya Sen (1983): Poverty and Famine
3. Barrington Moore (1993): Social Origins of Dictatorship and Democracy: Lord and Peasant in the Making of the Modern World
4. Barbara Ehrenreich (2002): Nickel and Dimed On (Not) Getting By in America
5. Carl Sagan and Ann Druyan (1997): The Demon Haunted World: Science as the candle in the Dark
6. Clayton Christensen (2003): The Innovator's Dilemma
7. Daniel Boorstin (2001): The Discoverers
8. Steven D. Levitt and Stephen J. Dubner (2006): Freakonomics
9. David Halberstam (2001): The Best and the Brightest
10. Donella Meadows et al (2004): Limits to Growth: a 30-year update
11. Everett Rogers (2003): Diffusion of Innovation
12. Herman Daly (ed.) (1993): Valuing the Earth
13. James Ferguson (1994): The Anti-Politics Machine
14. James Loewen (2008): Lies My Teacher Told Me
15. Jared Diamond (2005): Guns, Germs and Steel
16. John Perkins (2005): Confessions of an Economic Hit Man
17. Lester Thurow (1993): Head to Head
18. Paul Farmer (2004): Pathologies of Power
19. Paul Samuelson and William Nordhaus (2006): Economics
20. Stephen Kinzer (2007): Overthrow
21. Greg Mortenson and David Oliver Relin (2007): Three Cups of Tea
22. Tracy Kidder (2004): Mountains Beyond Mountains
23. V. S. Naipaul (1992): India: A Million Mutinies Now
24. Stephen Ambrose (1998): The Rise to Globalism: American Foreign Policy since 1938
25. Paul Hawken, James Oglivi, and Peter Schwartz (1982): Seven Tomorrows
26. Peter Schwartz (1996): The Art of the Long View
27. Thomas Kelly (2005): The Ten Faces of Innovation: IDEO's Strategies for Defeating the Devil's Advocate and Driving Creativity Throughout Your Organization
28. Donald Norman (2002): The Design of Everyday Things
29. Paul Polak (2007): Out of Poverty
30. Jonathan Koomey (2008): Turning Numbers into Knowledge